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PROBE FOR ELECTROMYOGRAPHIC EXAMINATION

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The invention relates to a probe for the electromyographic examination of the diaphragm in which the probe is applied to the penetration site, esophagus/diaphragm--introduced through the mouth or nose--and can register the electrical activities there. Furthermore, it can serve to conduct electrocardiograms (via the same pathways), of the activities of sphincters and other muscular hollow organs in human, veterinary, and experimental medicine.

For examinations with such probes it is of particular importance that the measurement electrodes of the probe be applied as precisely as possible at the organ site to be examined, that they can be fixed in the desired location during the examination, and that they apply a constant pressure to the organ.

Probes for such examination purposes are known that consist of a single or multilead, insulated, flexible cable, which also serves to aid introduction of the electrodes into the relevant organ. The electrical activities are conducted from the electrodes located at the end of the cable via the cable and a connection plug to the measurement device.

The disadvantages of the probes known to date are apparent in the following properties:

1. The cables must be flexible, but for this reason they easily roll up or become bent. Therefore, they are difficult to introduce and position at the desired site.

2. The measurement head with electrodes must--in order to be introduced at all--be small in relation to the introduction opening. The required consistent contact with the organ wall is difficult to achieve due to the difference in size between the measurement head and the breadth of the organ. Without such regular, intensive, and locally consistent contact, reliable measurements are not possible.

To avoid the described disadvantages, the probe according to the invention has the following features:

1. The probe consists principally of an inflatable measurement head with one or more measurement electrodes and a ground electrode.

2. This measurement head is connected with a manual air pump via an air channel inside the hose. The elasticity of the hose is selected so that it cannot roll up during insertion. For the same reason, the possibility of its becoming bent is also excluded.

3. The measurement electrode and the ground electrode are connected with the measurement device via a multilead cable running through the cable channel of the hose.

In Figures 1-5, an embodiment example of the invention is represented:

Figure 1 shows the entire probe with its principal parts. Measurement head 1 bears measurement electrodes 2 and 3 as well as ground electrode 4. This measurement head 1 is attached to dual-channel hose 5. At the other end of hose 5, manual air pump 6 is connected to one channel. Running through the second channel is multilead, insulated cable 7 which connects the measurement electrodes and the ground electrode with plug 8 of the customary type. The probe is connected to the measurement device via plug 8.

Figure 2 presents measurement head 1 enlarged and in detail. Inflatable membrane 11 is fastened to the outside of hose 5 with air channel 9 and cable channel 10, whereby air channel 9 ends underneath membrane 11 in opening 12 of the hose wall. Electrodes 2 and 3 are permanently fastened to the outside wall of membrane 11. They are connected conductively to leads 13 and 14 of cable 7, whereas lead 15 is connected conductively to ground electrode 4. Ground electrode 4 is designed in form so that the opening of cable channel 10 is impermeably sealed. Leads 13 and 14 leading to the electrodes are brought out from cable channel 10 through a side opening 16 of the hose and membrane 11. Membrane 11 is fastened, for example, such that both of its ends 17 and 18 adhere impermeably to the hose 5, whereas the middle membrane portion loosely encases the hose. Adhesion site 17 also surrounds opening 16.

For additional fixation of electrodes 2 and 3 and simultaneously to insulate conduction leads 13 and 14, a second membrane 19 is drawn over and its ends are permanently and

impermeably connected to membrane 11. Membrane 19 has openings 20 to expose electrodes 2 and 3. The size of the larger of openings 20 is such that, on one hand, electrodes 2 and 3 are maintained in position, but on the other hand the edges of electrodes 2 and 3 are still covered in order to avoid injuries to the organ wall. In order to achieve good contact of the electrodes with the organ wall, it is expedient to design the electrodes with a spherical shape at their contact side, so that they project over the level of membrane 19.

Figure 3 shows a view from above of electrodes 2 and 3 with connection leads 13 and 14, opening 16 through which cables 13 and 14 run, and also openings 20 of membrane 19.

Figure 4 shows the position of the probe in the inflated state in organ 24 to be examined.

Figure 5 represents the connection of manual air pump 6 with valve 21, also enlarged. Valve 21 is inserted air-tight into air channel 9 of the hose. On the opposite side, the valve is designed so that manual air pump 6 can be attached in the known manner, such that it can be removed. For the manual air pump, it is most expedient that a piston pump is used whose air volume is such that it is not possible for membrane 11 to be destroyed by excessive air pressure. The cylinder of piston pump 6 is also expediently provided with scale 22 so that exact metering of the compressed air is possible. In the known manner, linear scale 23 is attached to the outside of hose 5, by which the exact position of the inserted electrodes can be determined.

Claims

1. Probe for the electromyographic examination of muscular organs in human, veterinary, and experimental medicine characterized in that the measurement head fitted with measurement electrodes consists of elastic material and can be inflated by means of the introduction of air.

2. Probe according to Claim 1, characterized in that the measurement head is fastened to a dual-channel elastic hose and is guided to the organ to be examined with this hose.

3. Probe according to Claims 1-2, characterized in that, through one channel of the hose, air is pumped into the measurement head by means of an air pump, inflates the measurement head, and brings it to lie firmly against the organ wall.

4. Probe according to Claim 1-3, characterized in that running through the second channel of the hose is a multilead cable that transmits the electrical activity occurring at the electrodes in the organ to be examined to the measuring and/or recording device.

5. Probe according to Claim 3, characterized in that, for the air supply, a manual piston pump is used whose air volume can be metered.

6. Probe according to Claim 2, characterized in that the hose bears on its outside wall a linear scale for the exact positioning of the electrodes.

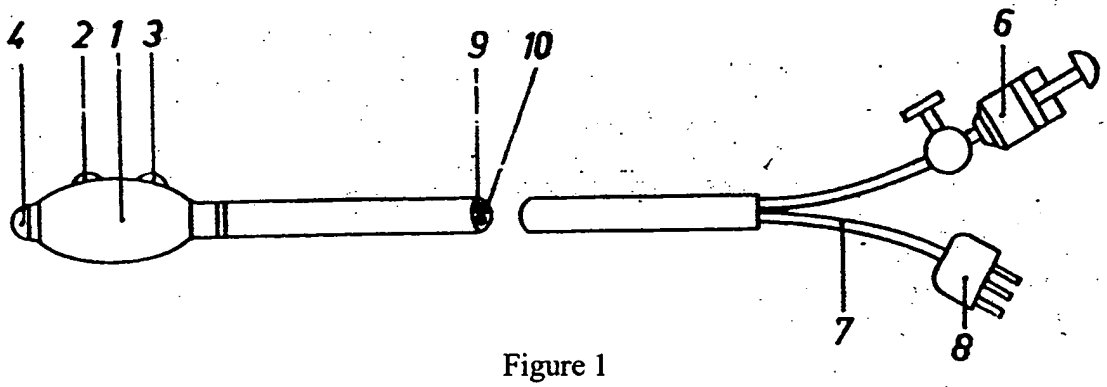

Figure 1

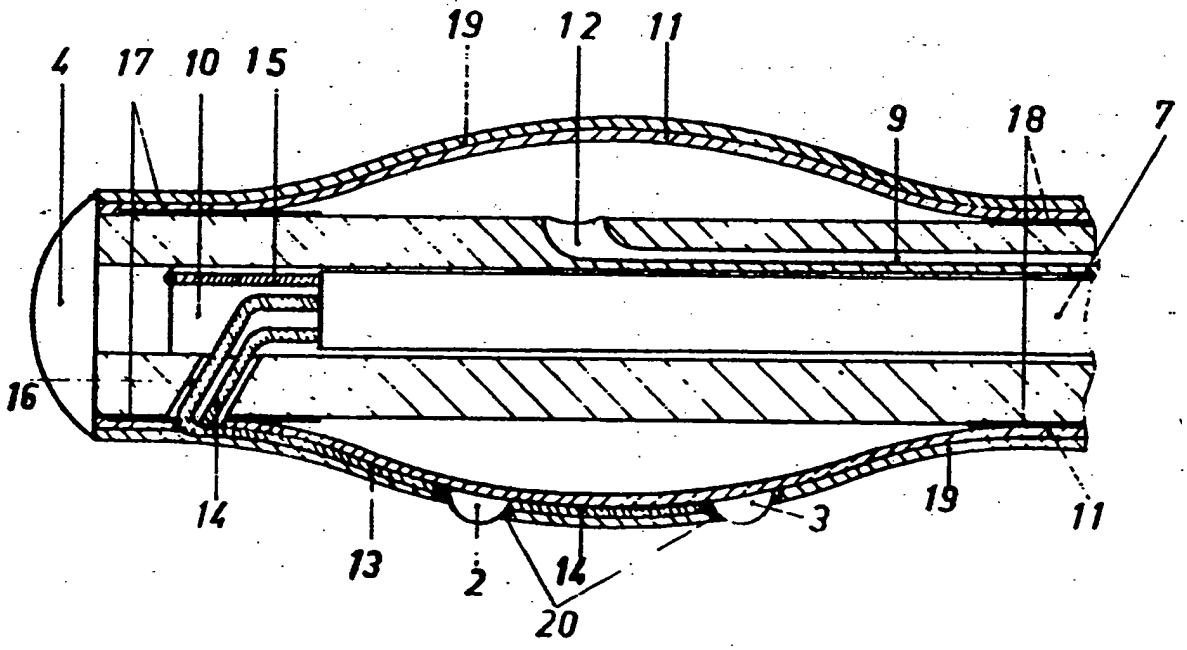

Figure 2

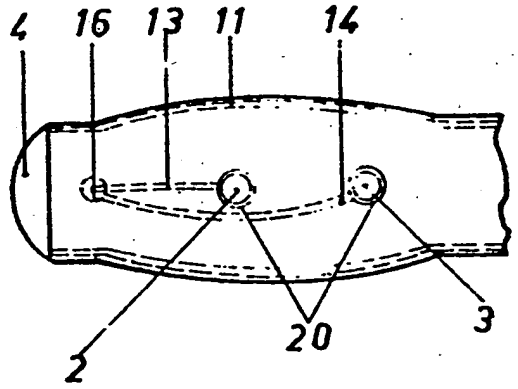

Figure 3

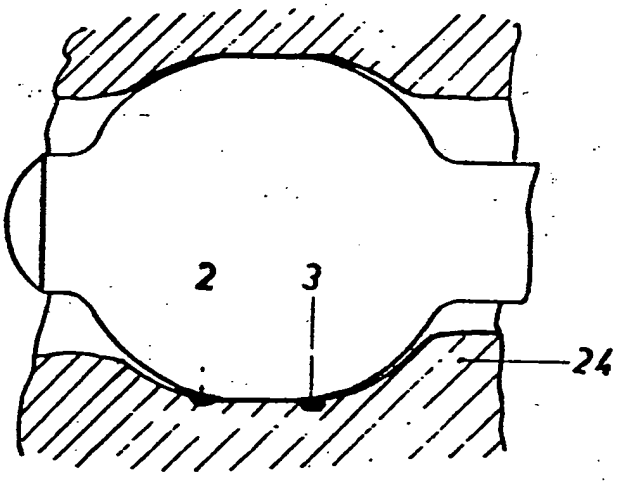

Figure 4

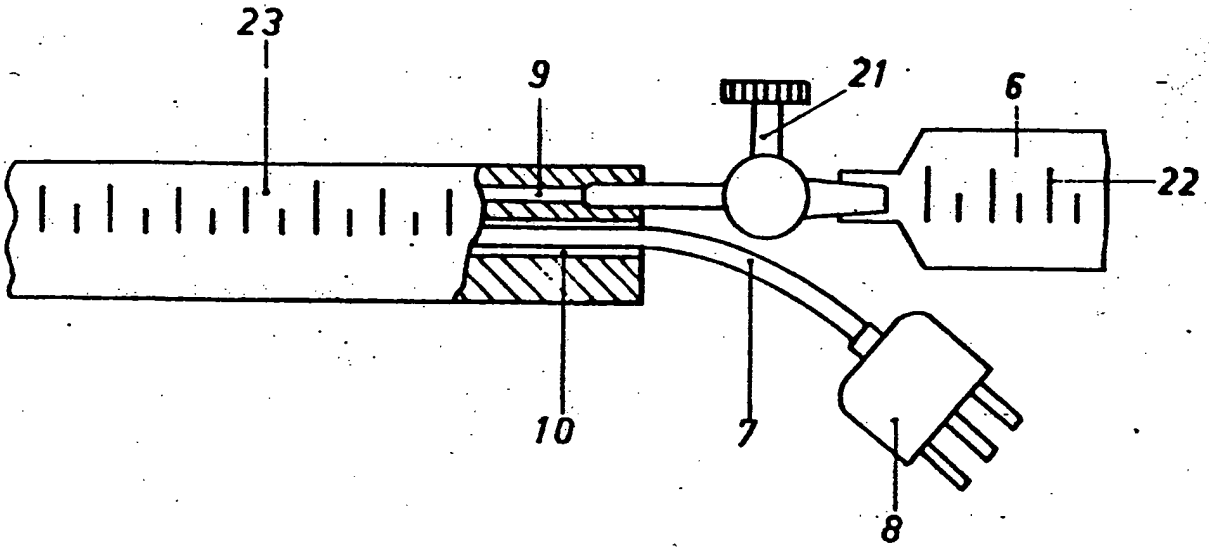

Figure 5